Conservation of Masbedda (*Gymnema sylvestre R. Br.*) through propagation

by

K. K. I. U. A. Kumara

This thesis was submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfilment of the requirements for the Degree of Master of Science in Environmental Management

Department of Civil Engineering
University of Moratuwa
Sri Lanka

August, 2004

DECLARATION

The work included in the thesis in part or whole has not been submitted for any other academic qualification at any institution.

Date: 02/08/2004

K. K. I. U. A. Kumara

I certify that the above statement is correct.

Date: 02/08/2004

Dr. S. Subasinghe
Senior Lecturer
Department Crop Science
Faculty of Agriculture
University of Ruhuna
Kamburupitiya

Date: 4/08/2004

Dr. Mahesh Jayaweera
Senior Lecturer
Department of Civil Engineering
University of Moratuwa
Moratuwa

ABSTRACT

Several activities could be undertaken aimed at conservation and sustainable use of medicinal plants. Some of them are undertaken directly at locations where plants are naturally occurring, while others are less direct, such as commercial cultivation systems. Cultivation of medicinal plants is particularly important for species, which already have a good market demand. *Gymnema sylvestre* is one such rare medicinal plant. Therefore, the present study was aimed at developing cost effective and simple propagation techniques for *Gymnema sylvestre*.

Investigations on both sexual and vegetative means of propagation of *Gymnema* have been carried out, at the Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya from October 2002 to November 2003. Viable, uniform seeds were screened and used for seed propagation studies. The effect of sowing media on germination of *Gymnema* seeds has been investigated using four kinds of sowing media; sand, coir dust, a mixture of top soil and sand (1:1) and a mixture of sand top soil and coir dust (1:1:1). Seeds were stored in an open system under room temperature (30 ^{0}C) and germination percentage was recorded at 15-day intervals. This was to find out the effect of storage period on germination of seeds. Complete Randomized Design was used for the experiments with five replicates, each contained ten seeds. Germination percentage was calculated and the experiments were repeated to confirm the results.

For vegetative propagation studies, three separate experiments were carried out using stem cuttings. Double nodal semi-hard wood cuttings were rooted in polybags filled with different rooting media including sand, a mixture of sand and top soil (1:1), a mixture of sand, top soil and compost (1:1:1) and top soil alone to investigate the effect of media on rooting. Hard wood, semi-hard wood and soft wood cuttings were planted in polybags filled with a mixture of sand, top soil and compost (1:1:1), to determine the effect of maturity of cuttings on rooting. Effect of watering on rooting of cuttings was investigated using semi-hard wood cuttings planted in polybags contained a potting mixture of sand, top soil and compost (1:1:1) with three watering frequencies. Complete Randomized Design was used for the studies with ten replicates. Number of roots, root length and root biomass accumulation were measured at the end of 6,10 and 14 weeks after planting.

Results showed that germination percentage of seeds was significantly ($p \leq 0.05$) high (92 %) in coir dust, whereas the lowest germination percentage (28 %) was observed from top soil media. There were no significant ($p \leq 0.05$) differences in germination of seeds throughout the first two months of storage under normal condition. Results of the vegetative propagation studies revealed that a mixture of sand, top soil and compost (1:1:1) was the most suitable rooting media for *Gymnema* cuttings, whereas the semi-hard wood cuttings rooted significantly ($p \leq 0.05$) higher than the hard wood and soft wood cuttings. With regard to the watering frequency, cuttings watered once in two days rooted and performed significantly ($p \leq 0.05$) better than the other treatments.

Results can be concluded that *Gymnema sylvestre* can be propagated by means of both sexual and asexual methods. Semi-hard wood cuttings, which appear to be more amenable to rooting and potting mixture of sand, top soil, and compost watered once in two days, showed the best results, while high germination percentage of seeds could be obtained within first two months of storage.

ACKNOWLEDGEMENTS

I wish to express my deep gratitude and sincere appreciation to my supervisor Dr. S. Subasinghe, Senior Lecturer/Head, Department of Crop Science, Faculty of Agriculture, University of Ruhuna, for the encouragement and guidance; continued support and invaluable advice given to me throughout this study and allowing me to use facilities in the Department of Crop Science, in order to make this study a success.

I sincerely thank Dr. Mahesh Jayaweera, Course Co-ordinator, M.Sc./P.G. Diploma in Environmental Engineering and Management, for making arrangements to conduct this study at the Faculty of Agriculture, University of Ruhuna, and for his continued supervision and invaluable advice.

My thanks are due to Prof. (Mrs) N. Ratnayeke, Director, Environmental Division, Department of Civil Engineering , University of Moratuwa, for spending her valuable time with us, throughout the course and continued encouragement.

I would also like to thank Dr. M. de S. Liyanage, Senior Lecturer, Department of Crop Science, Faculty of Agriculture, University of Ruhuna, for his valuable advice and guidance.

I very much like to thank all the non-academic staff in the Environmental Division of the Department of Civil Engineering, University of Moratuwa for their assistance throughout the study period.

I am sincerely grateful to the staff of the Department of Crop Science, especially to Miss Dilusha B. Weerathunge for her assistance in data analysis.

Last, but not least, I take this opportunity to thank the Sri Lanka Conservation and Sustainable Use of Medicinal Plants Project for their financial assistance to support this study.

LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

ABBREVIATIONS

MAP – Medicinal and Aromatic Plants

WHO – World Health Organization

WL_2 – Low Country Wet Zone

CRD – Completely Randomized Design

DMRT – Duncan's Multiple Range Test

WAP – Weeks After Planting